AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1-53 (Canceled)

54. (Currently amended) A solar cell comprising:

a germanium substrate; ~~and~~

a layer of material ~~including In and P~~ selected from the group consisting of InP and InGaP disposed directly on the germanium substrate; and

a diffused photoactive germanium junction in the substrate.

55. (Previously presented) A solar cell as defined in claim 54, wherein the layer of material is InGaP.

56. (Previously presented) A solar cell as defined in claim 54, further comprising a top solar subcell formed from InGaP, a middle solar subcell formed from GaAs, and a lower solar subcell formed in the germanium substrate.

57. (Canceled)

58. (Currently amended) A solar cell as defined in claim [[57]] 54, wherein the diffused junction is formed by the diffusion of arsenic into the germanium substrate.

59. (Previously presented) A solar cell as defined in claim 54, wherein the layer of material has a lattice parameter substantially equal to the lattice parameter of the germanium substrate.

60. (Previously presented) A solar cell as defined in claim 54, wherein the layer has a thickness equal to 350 Angstroms or less.

61. (Previously presented) A solar cell defined in claim 54, wherein the cell is capable of photoactively converting radiation ranging from approximately ultraviolet (UV) radiation to radiation having a wavelength of approximately 1800 nm.

62. (Previously presented) A solar cell defined in claim 58, wherein the junction in the germanium substrate layer is located between 0.3 μm and 0.7 μm from the top surface of the germanium substrate.

63. (Currently amended) A solar cell as defined in claim 54 [[57]], wherein the diffused germanium substrate forms a first cell layer and has a dopant diffusion profile that optimizes the current and voltage generated therefrom.

64. (Previously presented) A solar cell as defined in claim 54, wherein the cell has 1 sun AM0 efficiencies in excess of 26%.

65. (Currently amended) A solar cell comprising:

a germanium substrate;

a solar subcell layer overlying said substrate and composed ~~at least in part~~ of GaAs; and

a barrier layer overlying said substrate and underneath said ~~GaAs-containing~~ solar subcell layer and functioning to inhibit the diffusion of arsenic from the ~~GaAs-containing~~ the solar subcell layer into the germanium substrate.

66. (Previously presented) A solar cell as defined in claim 65, further comprising a solar subcell formed in the germanium substrate.

67. (Currently amended) A solar cell as defined in claim 66, wherein the subcell formed in the germanium substrate is formed from [[a]] an n-type germanium layer overlying a p-type germanium substrate.

68. (Previously presented) A solar cell as defined in claim 67, wherein the n-type germanium layer is formed by diffusion of arsenic into the germanium substrate.

69. (Previously presented) A solar cell a defined in claim 67, wherein the n-type germanium layer is formed by diffusion of phosphorous into the germanium substrate.

70. (Previously presented) A solar cell as defined in claim 67, wherein the n-type germanium layer is formed by diffusion of both arsenic and phosphorous into the germanium substrate.

71. (Currently amended) A solar cell as defined in claim 65, wherein the barrier layer is composed of ~~InGaP;~~ InGaP, InP, or GaP.

72. (Previously presented) A solar cell as defined in claim 65, wherein the barrier layer has a thickness of approximately 350 Angstroms or less.

73. (Previously presented) A solar cell as defined in claim 65, further comprising a two step diffusion profile in the germanium substrate with two different dopants.

74. (Previously presented) A solar cell comprising:

a first cell including a germanium (Ge) substrate having a diffusion region doped with n-type dopants including phosphorus and arsenic, wherein the upper portion of such diffusion region has a higher concentration of phosphorus (P) atoms than arsenic (As) atoms, and

a second cell including a layer of either gallium arsenide (GaAs) or indium gallium arsenide (InGaAs) disposed over the substrate.

75. (Previously presented) A solar cell as recited in claim 74, further comprising a nucleation layer deposited over said substrate that has a lattice parameter substantially equal to the lattice parameter of the germanium substrate.

76. (Previously presented) A solar cell as recited in claim 75, wherein the nucleation layer is a compound of InGaP.

77. (Previously presented) A solar cell as recited in claim 75, wherein the nucleation layer has a thickness equal to 350 angstroms or less.

78. (Previously presented) A solar cell defined in claim 74, wherein the solar cell is capable of photoactively converting radiation from approximately ultraviolet (UV) radiation to radiation having a wavelength of approximately 1800 nm.

79. (Currently amended) A solar cell defined in claim 74, wherein [[the]] <u>a</u> junction in the germanium substrate is located between 0.3 μm and 0.7 μm from the top surface of the germanium substrate.

80. (Currently amended) A solar cell as defined in claim 74, wherein [[the]] diffused phosphorus and arsenic in the germanium substrate has a diffusion profile that optimizes the current and voltage generated in the first cell.

81. (Previously presented) A solar cell as defined in claim 75, wherein the solar cell has 1 sun AM0 efficiencies in excess of 26%.

82. (Previously presented) A solar cell as defined in claim 74, further comprising a third cell disposed over the second cell layer.

Claims 83-97 (Canceled)

98. (New) A triple-junction solar cell comprising:

a first cell comprising a germanium (Ge) substrate having first and second diffusion regions doped with n-type dopants, wherein the second diffusion region lies deeper into the Ge substrate than the first diffusion region, wherein the first diffusion region has a higher concentration of phosphorus (P) atoms than arsenic (As) atoms and the second diffusion region has a higher concentration of As atoms than P atoms;

a nucleation layer disposed over the Ge substrate of the first cell;

a second cell layer comprising one of gallium arsenide (GaAs) and indium gallium arsenide (InGaAs) disposed over the nucleation layer; and

a third cell layer comprising indium gallium phosphide (InGaP) disposed over the second cell layer.

99. (New) The triple-junction solar cell as recited in Claim 98 wherein the nucleation layer

comprises a material having a lattice parameter substantially equal to the lattice parameter of the germanium substrate.

100. (New) The triple-junction solar cell as recited in Claim 98 wherein the nucleation layer comprises InGaP.

101. (New) The triple-junction solar cell as recited in Claim 98 wherein the nucleation layer has a thickness substantially equal to 350 Å or less.

102. (New) The triple-junction solar cell as recited in Claim 98, wherein the triple-junction solar cell is capable of absorbing radiation ranging from approximately ultraviolet (UV) radiation to radiation having a wavelength of approximately 1800 nm.

103. (New) The triple-junction solar cell as recited in Claim 98 wherein the junction depth in the first cell layer is substantially between 0.3 μm and 0.7 μm.

104. (New) The triple-junction solar cell as recited in Claim 98 having 1 sun AM0 efficiencies in excess of 26%.

105. (New) A triple-junction solar cell comprising:

a dual-junction structure comprising a first junction and a second junction;

a third junction having a p-type substrate, wherein the third junction is doped with

arsenic (As) and phosphorus (P), wherein the p-type substrate includes first and second diffusion sublayers, wherein P atoms have higher concentration compared to As atoms in the first diffusion sublayer and As atoms have a higher concentration compared to P atoms in the second diffusion sublayer; and

a nucleation layer disposed between the dual-junction structure and the third junction and comprising a material that shares a substantially similar lattice parameter with the p-type substrate of the third junction, wherein the nucleation layer serves to control the diffusion of arsenic atoms into the substrate.

106. (New) The triple-junction solar cell as recited in Claim 105 wherein the p-type substrate of the third junction is germanium (Ge) and the nucleation layer comprises indium gallium phosphide (InGaP).

107. (New) The triple-junction solar cell as recited in Claim 105 wherein the nucleation layer has a thickness substantially equal to 350 Å or less.

108. (New) The triple-junction solar cell as recited in Claim 105 wherein the junction depth of the third junction is substantially between 0.3 μm and 0.7 μm.

109. (New) The triple-junction solar cell as recited in Claim 105 wherein the third junction comprises a two-step diffusion profile capable of optimizing current and voltage generated from the third junction.

110. (New) The triple-junction solar cell as recited in Claim 105 having 1 sun AM0 efficiencies in excess of 26%.

111. (New) The triple-junction solar cell as recited in Claim 105 capable of absorbing radiation ranging from approximately ultraviolet (UV) radiation to radiation having a wavelength of approximately 1800 nm.

112. (New) A multi-junction solar cell comprising:

a p-type germanium (Ge) substrate having a first surface, wherein the p-type Ge substrate further includes a first diffusion sublayer situated adjacent to the first surface of the p-type Ge substrate and a second diffusion sublayer situated adjacent to the first diffusion sublayer;

an indium gallium arsenide (InGaAs) nucleation layer disposed over the first surface of the p-type Ge substrate, wherein the InGaAs nucleation layer provides n-type phosphorus (P) atoms to the first diffusion sublayer, wherein the first diffusion sublayer has a higher concentration of P atoms than arsenic (As) atoms; and

a Gallium Arsenide (GaAs) buffer layer disposed over the InGaAs nucleation layer, wherein the GaAs buffer layer provides n-type As atoms to the second diffusion sublayer in response to the thickness of the InGaAs nucleation layer.

113. (New) The multi-junction solar cell of claim 112, further comprising a second surface

situated at the bottom of the multi-junction solar cell.

114. (New) The multi-junction solar cell of claim 112, wherein the second diffusion sublayer has a higher concentration of As atoms than P atoms.

115. (New) A multi-junction solar cell comprising:

a p-type germanium (Ge) substrate having a first surface, wherein the p-type Ge substrate further includes a diffusion portion having a first diffusion region situated adjacent to the first surface of the p-type Ge substrate and a second diffusion region, which includes a part of the first diffusion region, wherein the second diffusion region diffuses deeper into the Ge substrate than the first diffusion region;

a phosphorus (P) containing nucleation layer disposed over the first surface of the p-type Ge substrate, wherein the P containing nucleation layer provides n-type P atoms to the first diffusion region; and

an arsenic (As) containing buffer layer disposed over the P containing nucleation layer, wherein the As containing buffer layer provides n-type As atoms to the second diffusion region in response to the thickness of the P containing nucleation layer, wherein the second diffusion region has a higher concentration of As atoms than P atoms.

116. (New) The multi-junction solar cell of claim 115, further comprising a second surface situated at the bottom of the multi-junction solar cell.

117. (New) The multi-junction solar cell of claim 115, wherein the first diffusion region has a higher concentration of P atoms than As atoms.

118. (New) A multi-junction solar cell comprising:

a germanium (Ge) substrate having a first diffusion region and a second diffusion region, wherein the second diffusion region diffuses deeper into the Ge substrate than the first diffusion region;

a phosphide nucleation layer disposed over the first surface of the substrate, wherein the phosphide nucleation layer provides diffusion dopants of phosphorus (P) atoms to the first diffusion region; and

an arsenide layer disposed over the phosphide nucleation layer, wherein the arsenide layer provides diffusion dopants of arsenic (As) atoms into the second diffusion region in response to the thickness of the phosphide nucleation layer, wherein the first diffusion region has a higher concentration of P atoms than As atoms.

119. (New) The multi-junction solar cell of claim 118, further comprising a second surface situated at the bottom of the multi-junction solar cell.

120. (New) The multi-junction solar cell of claim 118, wherein the second diffusion region has a higher concentration of As atoms than P atoms.